

GEOLOGY OF PICNIC POINT, PORT PHILLIP BAY, VICTORIA

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Summary

Evidence for an emerged shore platform and an emerged shell bed or emerged beach at Picnic Point is described. The platform is in ferruginous sands often called 'Red Beds.' The partially cemented sands are shown to be horizontal, and conformable with the underlying ironstones, the presence of which determines the occurrence of the Point. Aboriginal kitchen middens consisting chiefly of *Mytilus* occur on the cliff tops. A collection of shells made from the emerged beach deposits before they were disturbed is listed.

Introduction

Discussion has taken place from time to time as to whether the shell beds at Picnic Point, Hampton, on Port Phillip Bay, are aboriginal kitchen middens, emerged shell beds, or both, and what their relationships are to the associated rocks. As active marine erosion is taking place, and harbour works were being effected, it was thought expedient to collect all available evidence. The results are also of some interest for studies in eustatic sea levels.

Picnic Point

EARLIER WORK

As long ago as 1854 and 1856, Selwyn in his reports on the geology of the Colony of Victoria (as it was then) referred to the shell beds round Port Phillip. Then Hart in 1893 gave a more detailed account of the rocks on the north-east side of Port Phillip, and described an emerged shell bed at Picnic Point 'a few feet above the present water level at its highest part'; Hall and Pritchard (1897, p. 225) questioned this. In 1909 Pritchard (p. 22) noted that earlier writers had often confused emerged shell beds with aboriginal kitchen middens, and named Hampton (i.e., Picnic Point) as one of the well-known localities where he claimed this confusion had taken place.

Later, Chapman (1929, p. 122) drew attention to the Picnic Point deposits and claimed that both kitchen middens and emerged shell beds were present there, stating that 'We may reasonably assume that these (the emerged shell beds) do not belong to the mounds (kitchen middens) above, as they consist of myriads of small shells, of no use to the aborigines for food, though mixed with larger, edible kinds; moreover, this lower bed is free from charcoal.' Chapman reproduced two photographs (figs. 45, 46) of the 'raised beach,' which was vegetated at that time.

Keble and Macpherson (1946, pp. 61-64) also expressed the opinion that shell beds and kitchen midden are both present, stating that 'At Hampton the wave platform which appears to have been formed on a raised beach is 23 feet above L.W.M., but there is evidence of a small amount of tectonic uplift since it was formed. It is covered with comminuted shells, mainly mussels, which may belong to the period of eustatic rise of sea level, or, as some maintain, to human agency, the

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platform showing evidence of having been the site of an aboriginal kitchen midden. Thirty or more species of mollusca, some marine worms, and a coral—all littoral species—are definitely associated with the formation of the raised beach.' The 'raised platform' of these authors is the top of the cliff 23 feet above L.W.M., and not the emerged platform shown in Fig. 1. The shell beds on the top of the cliffs are kitchen middens. The marine fauna mentioned is that collected by Hart when he was studying that shoreline, and it is now in the National Museum, Melbourne. It does not come from 23 feet above L.W.M., but, to use Hart's own words (1893, p. 158), from 'a few feet above the present water level at its highest part,' or as Chapman stated it, 'about 8 ft. above high-water mark' (caption of Fig. 46).

ORIGIN OF PICNIC POINT

The Point is present because of the protection afforded the shore by a hard, dark-brown, ferruginous sandstone. Similar ironstones occur at intervals along the shore, and are well developed, for instance, at Brighton Beach to the north, and Rickett's Point to the south. Smaller outcrops occur at close intervals all along the bayside. The occurrences have been explained by assuming a continuous ironstone bed which is flexed upwards in low folds to form small headlands like Picnic Point and Rickett's Point. This interpretation is considered unsatisfactory because (1) it does not account for the intervening smaller outcrops; (2) current bedding in the cliff at the Point shows the beds are horizontal; and (3) no evidence of dip in the ironstones can be found.

Because the higher beds in the cliff at Picnic Point are horizontal, the underlying ironstone could only be warped if there were an unconformity between the ironstone and the sands and gravels above. Indeed this was claimed by Hart (1893, p. 157). The top of the ironstone is irregular, and this may be why he assumed it was eroded. Hall and Pritchard (1897, p. 190) interpreted Hart's 'unconformities' as localized examples of cross-bedding. Just south of the actual Point at Hampton there are some dips of 1° to 2° which are so interpreted. Recent erosion at Picnic Point has cut in behind the ironstone, and it reveals that the irregular upper surface of the ironstone is due to irregularities of cementation by ferruginous matter. A light-grey clayey sand is seen to lie behind and partly underneath the ironstone, penetrating irregularly into it. The clayey sand is continuous with the cliff material and there is no sign of any break in sedimentation, i.e., no diastem or disconformity, much less an unconformity. A close parallel to the relationships existing between the clayey sand and the ironstone can be seen in a number of places in the present cliff face where there is secondary cementation with ferruginous matter, although the process has not gone as far as in the ironstone. The ferruginous depositions have stained and cemented the sands of the cliff, but in such a way as to leave pockets of unstained and uncemented sediments so that the two types of rock interpenetrate considerably.

It is therefore inferred that the ironstone bed is not a separate stratigraphical unit, but is conformable with the sands above. The ironstone is merely a more highly ferruginous phase of the same sediments. It has been noted that the ironstones occur at depositional base levels, for instance on top of the Older Basalt at Royal Park and West Essendon, and at water level along the bayside.

AGE OF THE IRONSTONES

No fossils have been found in the ironstones or sands at Picnic Point by the writer, but Hall and Pritchard (1897, p. 202) record finding some, although a list

was not given. However, 300 yards south of the Brighton Pier, fossils were found in a similar ironstone by Mr. F. A. Cudmore before this locality was covered during foreshore improvements. Mr. Cudmore's collection, now in the National Museum, includes:

GASTEROPODA	<i>Leiopyrga quadricingulata</i> Tate (common)
LAMELLIBRANCHIATA	<i>Tellina albinoides</i> Tate
SCAPHOPODA	<i>Dentalium</i> sp.

Recently Mr. A. A. Baker discovered a small pocket of fossils in ironstone on the shore 20 chains south from Black Rock point (on which is the pier), almost opposite Seaview Crescent, but a little south of it. A piece of this rock presented to the National Museum (Reg. No. 14680) contains the following fossils:

GASTEROPODA	<i>Leiopyrga quadricingulata</i> Tate
LAMELLIBRANCHIATA	<i>Donax depressa</i> Tate
	<i>Nuculana crassa</i> (Hinds)

The determinations from the above two localities were made by Mr. Cudmore and the writer, and the age is believed to be Kalimnan (Lower Pliocene) although the evidence is not altogether conclusive. However, *Leiopyrga quadricingulata* is a common fossil in the type Kalimnan beds, and Singleton (1941, p. 42) named *Nuculana crassa* as a fossil typical of the upper shell bed of the type section. In the National Museum there are specimens of *Donax depressa* (Reg. No. 12789) and *Tellina albinelloides* (Reg. No. 12788) preserved in a ferruginous sandstone similar to that of the Port Phillip area (i.e., a similar facies) from Boggy Creek, near Bairnsdale, where beds of Kalimnan age occur.

The ironstone beds at Rickett's Point, four miles S.S.E. of Picnic Point, are mapped as Cheltenhamian (Upper Miocene) by Singleton (1941), while the lower beds at Royal Park and the ironstones at Keilor are stated to be Balcombian (Middle Miocene). So it would appear that the ironstones, although of similar lithology and occurring in similar circumstances in the Port Phillip area, are not of the same age.

EMERGED SHORE PLATFORM

On the south side of Picnic Point, erosion has shown a shore platform cut behind the ironstone beds in soft clayey sands (Fig. 1). The platform is 28 feet wide, and is 15 inches higher at the edge of the former sea cliff than it is at the

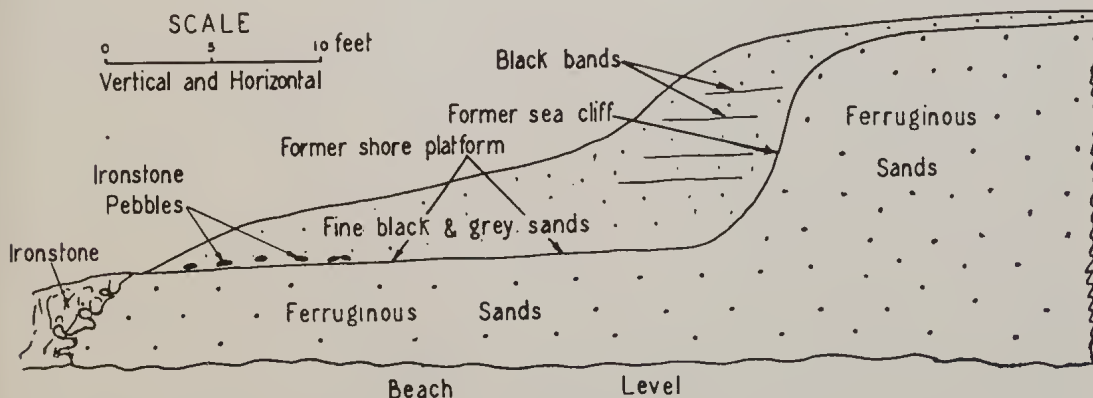


FIG. 1.—Cliff section on south side of Picnic Point, Hampton, exposed by marine erosion.

seaward edge. The latter is 8.5 feet above Admiralty datum (M.L.W.S.; see Fairbridge and Gill 1947). Active erosion has been progressing of recent years during which the platform has been under observation, with the result that it is clear that a true platform is present, i.e., the section line is not a random cliff section simulating a platform. The platform is on a relatively stable part of Port Phillip, being west of Selwyn's Fault and the Bellarine hinge-fault (Keble 1946).

At a number of places round the shores of Port Phillip Bay there are low platforms in front of former sea cliffs. The nearest to Picnic Point is that at Brighton Beach, where a wide platform extends in front of a cliff which is about 20 feet high at the highest part. A hole was sunk in the platform 25 feet seawards from the highest part of the cliff, and this penetrated three feet of fine grey (apparently aeolian) sand of the type found generally on top of the 'Red Beds,' then met the coarse red poorly-sorted and more compacted grits of the above formation. The material was compared with that in the adjacent cliff, and was found to be almost identical.

At Picnic Point ironstone pebbles occur on the seaward end of the emerged shore platform, and coarse sand marks the junction of the landward end. Above these are grey and black fine, well-rounded, siliceous sands such as cover the general terrain of this area, and the same as found on the Brighton platform. There is no real stratification in these sands at Picnic Point, but five thin darker bands noted in the landward end of the section are interpreted as former vegetated surfaces, or at least as surfaces on which organic matter gathered.

It is thought that after the recession of the sea from the platform the fine sand blew from the cliff above and gradually covered the platform, assisted by the usual gravitational drift from the higher to the lower areas. The dark bands in the sands may represent stages in the building up of the deposits on the platform.

In the present state of our knowledge of the Port Phillip area, it is not known to what extent eustatic and/or tectonic factors are responsible for the emergence of this platform.

CLUBHOUSE SECTION

On the north side of Picnic Point, a large area has been planated for the accommodation of the boats and clubhouse of the Sandringham Yacht Club. A retaining wall was built and then the cliff excavated to fill in along the wall, and to extend the chosen level landwards. Near the Point, a section is to be seen beside the clubhouse as shown in Fig. 2. There the ferruginous sands constitute an old sea cliff which is covered with a drift of grey sand and with midden material. Following the angle of the former cliff there occurs in the sands a dark line of charcoal and broken *Mytilus* shells, some burnt, such as can be seen in the middens still on the tops of the cliffs in this area. The middens consist almost entirely of *Mytilus*, which still occurs in large numbers in the waters round the Point. Occasional *Haliotis*, *Turbo*, and *Ostraea* are found in the middens, but these are the exceptions and *Mytilus* the rule.

At the base of the seaward part of the section are ironstone pebbles up to three inches in diameter, distributed horizontally. In close proximity to these were found marine shells which had clearly been worn on a beach—*Katelaysia*, *Ostraea*, *Mytilus*, *Arca*, *Austrocochlea*, and some minute gasteropods. The calcareous tubes of the marine worm *Serpula* were also present. The shells found in middens are of edible types and sizes, and they are not worn, because they have been gathered alive from the water. Of the shells named above, a number were not edible species

or edible sizes, and, being worn, they could not have been carried ashore for food by aborigines.

Above the horizon just described was a layer of charcoal with broken and burnt shells, viz., the remains of a midden. Whether this represented a midden on the old 'raised beach' or comminuted material transported from the middens on the top of the cliff could not be determined with certainty, but in view of the thinness of the deposit the latter is thought to be the more likely explanation.

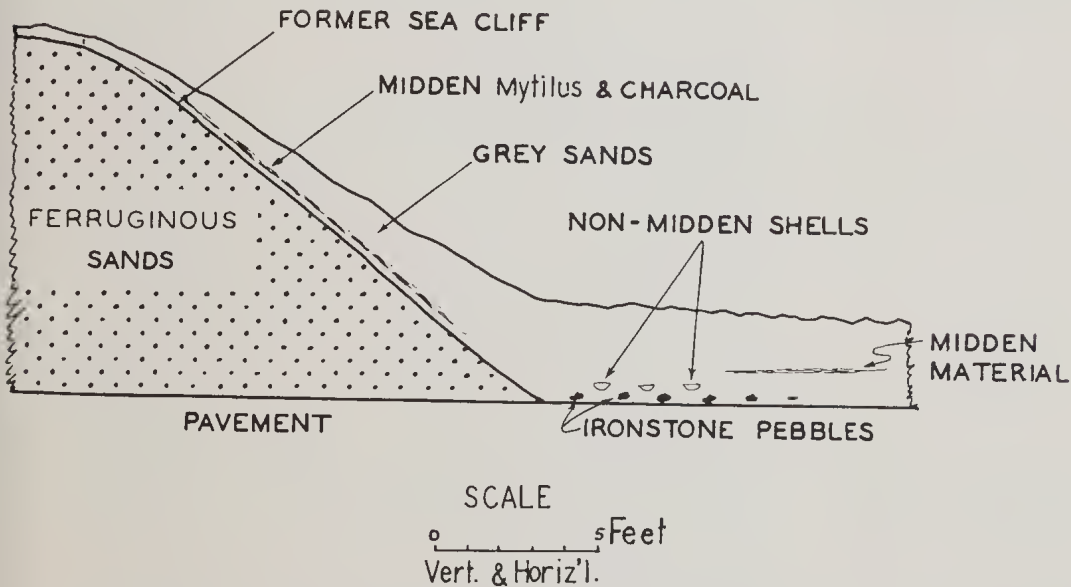


FIG. 2.—Section is cutting made to accommodate the Sandringham Yacht Club clubhouse on the north side of Picnic Point, Hampton.

On the Point side of the section just described is a slope of grey sand in which there are numerous shells. In an effort to determine the nature of this deposit, and to discover whether it is *in situ* or not, a hole was carefully sunk 15 feet from the clubhouse towards the Point. Samples of sand were taken, and fossils carefully collected to a depth of over three feet, where two pieces of broken glass were found! This proved, of course, that the material was not *in situ*; it was probably thrown there during the excavation to accommodate the clubhouse building. Although no inference can be made concerning the position of this material, inferences can be made relative to its composition. The majority of the shells were not of edible kinds, and many of them were worn, indicating that they had been subjected to abrasion on the beach. Further, they were all through the sand, and not just on the surface as would be the case with shells carried by picnickers from the present beach. Also, as one ascends the slope these shells become more and more scarce, and no such deposits are found on the tops of the cliffs. The cliff-top shells all belong to the middens, there being no emerged shell bed or beach there. Middens are commonly on the higher points, as no doubt the aborigines wanted to see what was happening, and also to guard against surprise.

EMERGED SHELL BED FAUNA

In the National Museum, Melbourne, there is a collection of fossils from 'Raised Beach, Picnic Point, Hampton,' presented by Mr. T. S. Hart on 20/1/04. The fossils are significant in that they were collected by an experienced observer before the Point was disturbed by the human activities and bayside erosion which now make its interpretation difficult. The collection comprises the following forms:

		Nat. Mus. Reg. Nos.
COELENTERATA	<i>Orbicella urvillei</i> Edwards and Haime	8679-8680
LAMELLIBRANCHIATA	<i>Amphidesma nitida</i> (Deshayes)	8700-8706
	<i>Anadara trapezia</i> (Deshayes)	8681
	<i>Arca pistachia</i> Lamarck	8684-8686
	<i>Cardium racketti</i> Donovan	8688
	<i>Cleidothermus albida</i> Lamarck	8682, 10755
	<i>Electromactra ovalina</i> (Lamarck)	8691
	<i>Eumarcia fumigata</i> Sowerby	8644-8649
	<i>Katclysia strigosa</i> (Lamarck)	8689-8690
	<i>Notovola fumatus</i> (Reeve)	8683
	<i>Ostraca</i> sp.	8695
	<i>Solen vaginoides</i> Lamarck	8692-8693
	<i>Solcellina biradiata</i> (Wood)	8694
	<i>Wallucina icterica</i> (Reeve)	8687
GASTEROPODA	<i>Austrocochlea odontis</i> (Wood)	8714-8717
	<i>Bembicium melanostoma</i> (Gmelin)	8733-8735
	<i>Cellana tramoserica</i> Sowerby	8696-8697
	<i>Cominella lineolata</i> (Lamarck)	8737-8738
	<i>Clanculus plebeius</i> Phillips	8718-8723
	<i>Haliotis ruber</i> Leach	8707
	<i>Herpetopoma baccatus</i> (Menke)	8736
	<i>Hypotrochus monachus</i> (Crosse and Fischer)	8729-8732
	<i>Mactola anomala</i> (Angas)	8742
	<i>Parcanassa jonasi</i> Dunker	8740
	<i>P. pauperata</i> (Lamarck)	8739
	<i>Patelloida alticostata</i> Angas	8698-8699
	<i>Phasianella australis</i> (Gmelin)	8711-8713
	<i>Salinator fragilis</i> (Lamarck)	8728
	<i>Turbo undulatus</i> Solander	8708-8710
	<i>Uber conicum</i> (Lamarck)	8724-8727
	<i>Vermicularia siphon</i> Lamarck	8741
	<i>Zacumantus cecithium</i> (Quoy and Gaimard)	8743

I am indebted to Miss J. H. Macpherson, B.Sc., conchologist at the National Museum, for bringing the nomenclature of these shells up to date in accordance with a check list about to be published (Chapple and Macpherson 1950).

Conclusions

1. There is an emerged shore platform at Picnic Point, 8.5 feet above mean low water springs.
2. The ironstones and the uncemented parts of the 'Red Beds' interpenetrate at Picnic Point, and so must be conformable, no unconformity existing as previously suggested.
3. Current bedding shows that the deposits at the Point are horizontal, and so the Point was not formed by local warpings as has been suggested.
4. There are evidences of an emerged beach or shell bed at the Point, and this fits in with the evidence of the shore platform. However, the deposits have been

disturbed by human agency, and so written and photographic evidence pre-dating this disturbance are used to assist interpretation.

5. Aboriginal kitchen middens consisting mostly of *Mytilus* and charcoal occur on the tops of the cliffs 23 to 27 feet above L.W.M., but there is no emerged shell bed there as has been claimed.

Acknowledgments

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